The Mounting Forceps (Figs. 32 and 33) was invented by me for holding the covering glass to the glass slide, when wiping and cementing its edges. It consists of a small forceps, to the jaws of which four little springs are attached, forming a movable joint; thus the distance between the extremities of the springs can be regulated, according to the size of the covering glass; the forceps is kept shut by a spring between its handles. This instrument will be found very useful for mounting microscopic preparations.

Fig. 32.

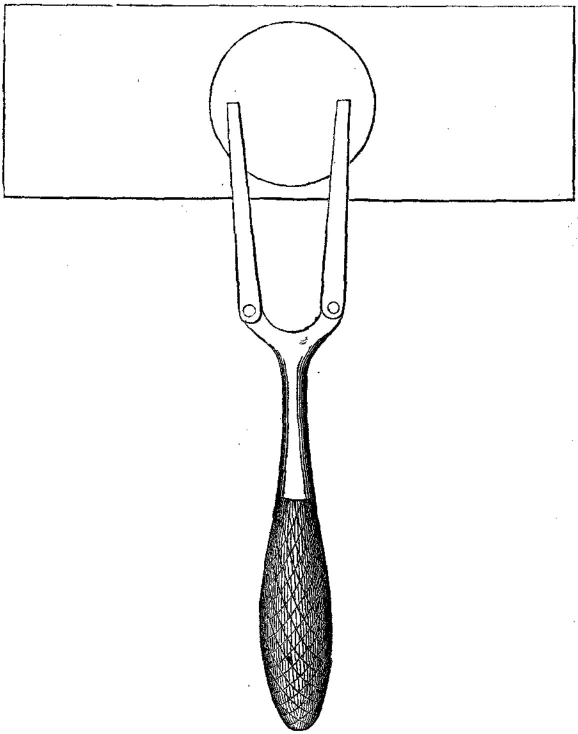
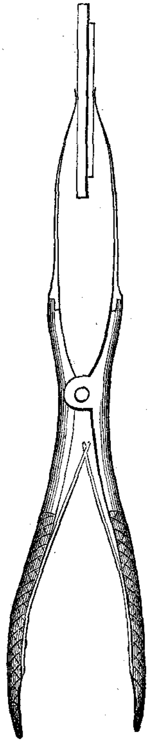


Fig. 33.



ART. II.—*Remarks on Sunstroke.* By JAMES J. LEVICK, M. D., of Philadelphia.

UNTIL a comparatively recent period there had been but little written on the subject of sunstroke, the name popularly given to those sudden attacks of loss of consciousness, with laboured respiration and prostration, which occur in such numbers during the summer season.

This circumstance may be attributed to two distinct causes: first, that, though of frequent occurrence with us, sunstroke is rare in England. It was from the mother country that, until comparatively lately, we derived most of our medical literature, and, as intimated, in England the affection is almost unknown. Dr. WATSON, in a brief allusion to the subject, states that he has never seen a case of the kind; and many English writers seem to ignore the existence of such an affection, by omitting any allusion to it in their treatises on the practice of medicine. What is known of it by our brethren in Great Britain appears to have been learned from the experience of the surgeons in India, where its effects are so fearfully felt. A second cause may be found in a mistaken classification, many cases of what would seem to have been genuine cases of sunstroke having been erroneously regarded as apoplexy, acute congestion, and inflammation of the brain.

And yet sunstroke has had its victims from the earliest times. In the sacred volume we have two instances recorded. The first, that of the son of the Shunammite, who, being "in the field with the reapers, said unto his father, 'My head, my head!' And when he had taken him to his mother, he sat on her knees till noon, and then died." (2 Kings iv. 19.) And again in the text given by Dr. Watson: "And Manasses was her husband, of her tribe and kindred, who died in the barley harvest; for as he stood in the field, overseeing them, and bound sheaves, the sun came upon his head, and he died in his bed in the city of Bethulia."

In looking over the various numbers of the *American Journal of the Medical Sciences*, from its commencement to the present time, I find twenty-four volumes to have been issued without a single paper on this subject, or even an incidental reference to the disease, as such. The first allusion to it is a short paragraph above the initials of "T. R. B.," which appeared in vol. i., N. S., p. 536, published in 1841, and which is as follows: "At this season, in 1821, the British frigate Liverpool was proceeding from Muscat to Bushire; the weather gradually increased in warmth; double awnings were spread, the decks kept constantly wetted, and every precaution used to prevent exposure of her men; yet in one day, from a species of *coup de soleil*, she lost three lieutenants and thirty men. If, for however brief a period, they exposed themselves to the sun, they were struck down senseless; vertigo followed, accompanied by foaming at the mouth." It is added: "The frigate's deck at one time resembled a slaughterhouse, so numerous were the bleeding patients." (*Wellsted's Travels to the City of the Caliphs.*) It will be remembered that the Persian Gulf intervenes between Bushire and Muscat, the latitude being about 25°.

In the same journal—vol. xviii., N. S., p. 66, 1849—Dr. H. Hartshorne reports four cases as treated at the Pennsylvania Hospital, two of which died.

In vol. xxi. p. 183, quoted from the *Transactions of the College of Physicians*, is a highly interesting paper by Dr. PEPPER on the subject, in which it is stated that "during the seven years preceding, twenty patients had been treated in the Pennsylvania Hospital for sunstroke; of these, *ten* died, *seven* recovered, and *three* became affected with a chronic affection of the brain, eventuating in insanity." Added to the paper of Dr. Pepper are some valuable remarks by Dr. CONDIE on the same subject. In the same volume, page 536, is an able article by Dr. LENTE, then Resident Surgeon at the New York Hospital. In this it is stated that in the year 1847 there were *thirty-seven* cases of sunstroke occurring in the city of New York *in four days*, most of whom died so promptly that it was impossible to convey them to the hospital. Of *forty-two* admitted into the hospital during five years, *twenty-four* died and *eighteen* survived. In the "Transactions of the Boston Society for Medical Improvement"—reported in vol. xxvii., 1854—several cases are recorded; and in the last published number of the *Journal* some brief remarks are offered on the same subject by the writer of this paper.

In the *Philadelphia Medical Examiner*, vol. i., N. S., p. 526, Dr. DOWLER, of New Orleans, in the course of some experimental observations on animal temperature, incidentally alludes to the subject of insolation. After expressing his surprise that so little distinction is made between *solar asphyxia*, as he calls it, and *solar syncope*, he says "solar asphyxia is always fatal;" but adds that this might be curable if the patient were bled *instantaneously*. He states that on the 23d of July, 1845—the thermometer being 105° to 150° in the sun—fifteen victims perished in one day in the city of New Orleans from sunstroke.

Essays on this subject have at various times appeared in the New York journals. One of the most comprehensive of these is that of Dr. Dowler, published in the *New York Medical Gazette*, July, 1851, and republished in the *New Orleans Medical and Surgical Journal*, January, 1856, page 470. Dr. ISRAEL MOSES records some interesting cases in the *New York Medical and Surgical Reporter* for the year 1846.

One of the most instructive and complete essays which have come under my notice in our recent journals is that of Dr. H. H. SWIFT, then Resident Physician of the New York Hospital, and published in the *New York Journal of Medicine*, vol. xiii., N. S., p. 45, 1854. I shall have occasion frequently to allude to this paper, and cannot avoid here stating that it enters so fully into the subject, that the results of the observations made by the author, and the inferences thus drawn and expressed, correspond so closely with my own, as to leave but little unsaid that I could wish to say. After describing the three different stages of the affection, as he considers them, Dr. S. states that of *one hundred and fifty* cases admitted to the New York Hospital, *seventy-eight* died.

In the *Buffalo Medical Journal* for 1856 is a paper by Dr. S. B. HUNT on sunstroke, having especial reference to its exciting causes. Allusions to the subject may be found in the writings of Drs. WOOD, GERHARD, DICK-

SON, CARTWRIGHT, and others of our own countrymen. As I have already intimated, but little has been written on this subject by the English. MOSELY, in a treatise on tropical diseases, published in London A.D. 1803, page 57, says: "In England, in 1707, on the 8th of July, many people at work, and many horses and oxen, were killed by the sun's rays; and in Pekin, in the year 1743, between the 14th and 25th of July, *eleven thousand* people perished in the streets from the same cause!" In the *Medical Gazette*, vol. xviii. p. 71, is a paper by Mr. RUSSEL, of the 73d regiment, then stationed at Madras, which, so far as I am aware, is the first which gives the true pathological condition found after death from sunstroke. The *Medical Times and Gazette*, 1857, page 416, contains in a paper on the diseases of the brain and nervous system, as they affect soldiers, &c., in India, by CHARLES ALEXANDER GORDON, surgeon to the 10th regiment, in which is given a brief notice of sunstroke as it occurs in India. Out of twenty-eight cases coming under this writer's notice, *but one* recovered. The latest—and, so far as I know, the best trans-Atlantic publication appeared a few months since in vol. xv., N. S., p. 624, of the same journal, the author of which, Dr. BEATSON, a surgeon in the army of India, employs Dr. Gordon's paper just referred to as a text for his subject, rejecting altogether the pathological and therapeutical views of Dr. Gordon.

As respects the frequency and fearful character of this affection, the preceding notices are of themselves sufficient evidence. Thirty-seven cases of sunstroke in four days, almost immediately fatal, as reported by Dr. LENTE, fifteen deaths from this cause in one day, as recorded by Dr. DOWLER, certainly present the matter in a sufficiently serious light, without further facts on my part; and yet the scenes I have myself witnessed, though never so fearfully numerous as those above recorded, have impressed me even more forcibly than this frightful catalogue alone could have done. In most other diseases the victim has some forewarning of his doom. When pestilence stalks the streets, men are on the fearful watch for its approach, and are prepared, at least for a time, to combat the destroyer; if they fall, it is with a broken sword, and with their armor pierced. But sunstroke gives no such warning. It strikes down its victim with his full armor on. Youth, health, and strength oppose no obstacle to its power; nay, it would seem, in some instances, to seek out such as these, as if boldly to flaunt its power, and in the very glare of day to deal its fatal blow. Those who have witnessed the scenes of domestic distress which every summer affords us, as husbands and fathers, who, but a few hours before, had left their families in full health, are brought back to them struck down by death, will not think me disposed unnecessarily to deepen the picture. As I have elsewhere said, I know no place other than the field of battle where such sudden destruction of human life occurs.

The *symptoms* of sunstroke are now too well known with us, at least, to render a detailed description of them necessary. Dr. Beatson gives three symptoms as the prominent ones in his cases, viz.: *unconsciousness*, *laboured respiration*, and *extreme prostration;* these are unquestionably the conditions we meet with in sunstroke; but similar phenomena present themselves in other affections. When, however, an individual, and still more so when a number of persons in ordinary health exposed to a temperature approaching 90° F. in the shade, are suddenly seized with these symptoms, for a moment perhaps preceded by thirst, vertigo, and a confused perception of colours, there can be little doubt that the attack is that of sunstroke.

The appearances described by different writers are very dissimilar. By some the pupil is found contracted, as in one case described by Russel (*loc. cit.*); so, too, by Hartshorne; while, on the other hand, Drs. Pepper, Lente, and Swift (*loc. cit.*), speak of dilatation of the pupil as of most frequent occurrence. Dr. Swift, however, adds that in what he calls the third stage, the pupils are often firmly contracted. "Of 33 fatal cases, the pupils were *contracted* in 20, moderately dilated in 7, and markedly so in 6; in the successful ones the pupils were *dilated* in 19, nearly natural in 15." (Swift, *loc. cit.*) This corresponds with what I have myself noticed. The probability is that the condition of the iris varies with different degrees of the affection, and is by no means a pathognomonic feature of the case.

The pulse, too, is differently described; by some as full and slow, by others as frequent, feeble, and thready; by Dr. Strong, of Boston, as in some cases "very strong;" by Dr. Coale, of the same society, as "very small." Dr. Dowler says: "The pulse is hurried, hobbling, and unequal, very often gaseous or air-like, but never slow, hard, and large, as in apoplexy." I have always found the pulse a feeble one; it is true, in some instances, a full one, but easily compressed, and frequent.

Coma and stertor are recorded by some as of almost constant occurrence, by others they are not mentioned. I have seen in some instances violent convulsions, while in the greater number of cases they have been absent. The truth is, as I have already intimated, that the symptoms vary with the difference in the intensity of the affection, and though it has not occurred to me to notice in so decided a manner the three stages described by Dr. Swift, yet I am quite prepared to adopt his classification. Dr. Dowler (*loc. cit.*) makes "a particular arrangement or classification of solar diseases, which is highly important in a practical point of view." He "submits the following: 1st. Solar Exhaustion or Syncope. 2d. Solar or Sun-pain. 3d. Solar Excitement or Inflammation. 4th. Solar Asphyxia."

"Solar exhaustion," he says, "differs from solar asphyxia both in symptoms and treatment. In solar asphyxia, the skin is extremely hot and generally dry; there is a choking sensation, and a total loss of sense. In solar exhaustion, the skin is moist, pale, and cool; the breathing is easy, though hurried; the pulse is small and soft; the vital forces fall into a temporary collapse, the senses remaining entire. Horizontal position, free air in the shade, external stimulants and frictions, are usually sufficient to restore the patient." The extensive experience of Dr. Dowler and his well known habits of accurate observation, give great weight to whatever suggestion he may make on this or any other subject; but, though certainly existing to some extent, I must acknowledge that the distinction between the different forms of solar disease has not been so well defined in the cases coming under my notice as in those seen by him.

The *cause* of this affection is suggested by the name popularly adopted, and though by no means of scientific origin, the term sunstroke or heatstroke, so long as we remain uncertain as to the exact pathological condition, may as well be retained.

While exposure to the direct heat of the sun is by far the most frequent cause of the affection, it is by no means the only one. Dr. Swift mentions eleven cases as occurring in a laundry, and several others in a sugar refinery; and the first case seen by me during the past summer was that of a man who had been at work for ten hours in a sugar refinery.

What is the kind of heat, and under what circumstances is it that these disastrous effects are produced? Almost all writers agree in classing among the causes which predispose to this result, fatigue, intemperance, improper clothing, being clad, as Dr. Dowler expresses it, "in garments which afford but a feeble resistance to the conduction of heat into the body." Dr. Beatson (*loc. cit.*) states that "it seldom occurs except after fatigue and exhaustion, under a tropical sun, aggravated, no doubt, by whatever tends to obstruct the freedom of the venous circulation of head and neck, and to produce such obstruction, I know of nothing—short of hanging—more effectual than the old leather stock and tight coatee collar." He might have added, anything which compresses the chest or waist, and thus interferes with the free expansion of the lungs. A case of this kind occurred in front of my office, on the occasion of the military parade in celebration of the laying of the Atlantic Telegraph Cable. A robust German soldier fell over in a state of unconsciousness, with laboured respiration, followed by a slight convulsion. I found him with a cravat fitting almost to strangulation, and with a belt so tightly encompassing the waist as to completely prevent the free and healthful expansion of the thorax and its contents; nor was it until all these ligatures had been removed that the favourable symptoms which terminated in recovery presented themselves.

While accepting the above as frequent auxiliaries in the development of sunstroke, my own observations by no means agree with those who believe it occurs chiefly to such as are addicted to the intemperate use of intoxicating drinks. Such was not the case with the patients treated in our hospital last summer, nor with those reported by Dr. Swift. In India it attacks most frequently soldiers whose military duties prevent such indulgence. So too with the sailors before reported. It is true, that scarcely a summer passes that cases of unconsciousness from intoxication are not brought to the hospital as cases of sunstroke, which, at the first glance, might be so considered. Sunstroke is by no means confined to the intemperate; indeed, I am much inclined to believe that a moderate amount of stimulant might act as a prophylactic. *Unacclimation* I believe to be a strong predisposing cause. With one exception, all the men treated in the Pennsylvania Hospital during the past summer were foreigners. *Position* acts as a favouring cause; as in stooping or bending forward. This was illustrated in the cases occurring among labourers employed in working with pickaxes in making the passenger railways in our city during the late summer; in two cases related by Dr. Coale, of Boston, of sailors attacked while bringing a ship to anchor; as well as in the many instances of day labourers, most of whom are in this position while at work.

But none of these circumstances is necessary for the production of the disease, and I have seen it attack with equal fatality the strong and vigorous as the enfeebled and poorly nourished. I have never as yet met with sunstroke affecting a negro, though told that such cases are not uncommon in the South; and the natives of India are, it is well known, not exempt from it.

What is the peculiar character of the heat which produces these effects?

Had this question been asked me before this paper was begun, I should have replied, from a vague impression made on my mind, that sunstroke was most frequent during an intensely dry heat. Such, however, does not accord with the observations of others, and such, I am inclined to think, from a more careful investigation, is not the case.

Dr. SANDFORD B. HUNT, in a paper on Sunstroke published in the *Buffalo Medical Journal*, advances the opinion, that *a high humidity* of the atmosphere is the condition most favorable for sunstroke. He quotes, among other cases to sustain this view, the eleven instances related by Dr. Swift as occurring in a laundry, the atmosphere of which, he asserts, was doubtless surcharged with aqueous vapour from the dampened linen. A somewhat similar condition of the atmosphere may be supposed to exist in a sugar refinery. In all cases coming under his notice, he found a high dew-point contemporaneous, and he ascribes the fatal results to the absence of the refrigerating effects of free evaporation from the surface. During three days of last summer, in which six cases of sunstroke were brought to the hospital, and in which many other cases occurred, the maximum temperature in the shade was 94° F, the barometer about 30, and *the dew-point* at 9 A. M. of each day was 74, 72, 72—a high range even when we regard the temperature, of which the record in the shade can give but an imperfect conception. In the very first case quoted by me, that of Wellsted in the Persian Gulf, it is said that the *decks were kept constantly wetted*, which, if the above view be correct, must have increased the number of fatal cases. It is true, that RUSSELL (*cit. supra*) reports his cases as occurring "at a season when the hot land winds had just set in, rendering the atmosphere dry and suffocating;" but, on the other hand, Dr. GORDON, writing from India, says: "India officers say the heat is not so much to be feared during the intensity of the dry heat, as in those calm sultry days when the sun is obscured by a film of clouds, or by impalpable dust, at seasons diffused through the atmosphere, these being the frequent precursors of an earthquake." Dr. BEATSON reports as the condition of the company to which he was attached, that they remained for three days and two nights located on a dry open rice flat without tents, exposed to and utterly unprotected from the blazing sun by day *and the heavy dews by night.* From a remark made by Dr. DOWLER (*loc. cit.*), I infer that his views correspond with those of Dr. HUNT. The latter correspond, too, as I shall hereafter show, with the occurrence of what are described by the older writers as predisposing causes of apoplexy. Though contrary to my own preconceived notions on the subject, I think it but fair to repeat that these views appear to be held by the majority of careful observers, and are well sustained by them.

Before calling attention to the pathological appearances and nature of the disease called Sunstroke, I wish for a few moments to recur to a statement made by me in the early part of this paper, that the paucity of medical literature on this subject, among the earlier writers, is to be accounted for on the supposition that many cases described as other diseases were really and would now be recognized as cases of sunstroke. Not to mention the cases of "death from cold water," which, I believe, are now generally admitted to have been instances of this kind, I am quite convinced that many cases of insolation have been regarded and treated as cerebral apoplexy.

Andral, in his *Clinique Médicale,* when describing various forms and causes of cerebral congestion, has the following:[1]—

> "Three labourers occupied in three different places in getting in the harvest during days when Reaumur's thermometer marked 40° (122 F.) in the sun, died suddenly. The circumstances accompanying these three deaths could only be ascertained in two of them, for the third was found dead. According to eye-witnesses, the two former could not have left their work more than five minutes before their death. They turned round, putting their hands forward, as if they had been deprived of sight and must have expired at the moment when they wished merely to sit down. The individual who died first, that is, on the 6th of July, was a man of mature age, but putrefaction made such rapid progress that it was impossible to keep his body till the proper time for examining it. The second died on the following day. It was a woman twenty-one years of age. Her body was examined—muscles well-developed; all the articulations were completely rigid; on the back and face were livid spots, and already the odour of putrefaction began to manifest itself; abdomen tympanitic, smooth, and free from spots. * * * No effusion was found between the dura mater and bones of the cranium, nor was any found over or under the pia mater, but the veins and arteries of these two membranes were gorged with blood. The brain presented

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[1] *Vide* Medical Clinic, or Reports of Cases by G. Andral, Professor, &c., translated by D. Spillan, M. D., &c. Bell's Medical Library, vol. viii. p. 199 *et seq.*

no irregularity, only its substance was very soft; the ventricles contained a little more serum than natural; * * * no signs of inflammation of the lungs or pleura, nor any effusion; * * * the pulmonary vessels were gorged with blood, and the bronchi filled with frothy mucus; * * * size of the heart natural; right ventricle a little distended and filled with liquid black blood; the left ventricle contracted and empty. On opening the abdomen, an infectious odour was diffused; * * * the uterus and ovaries contained a little liquid blood, and in the cavity of the pelvis were found an effusion of two ounces of blood. The third person died suddenly on the 8th July. This was a stranger, a woman between forty-eight and fifty years old. We proceeded on the following day in the morning to examine her body. * * * All the articulations were rigid; the back was traversed by blue spots; almost the entire face was covered with them; the face from the chin to the nose was absolutely livid; several were also to be seen on the chest, the size of which varied from that of a lentil to that of a twenty sous piece. These spots had precisely the appearance of petechiæ, and yielded when cut into some liquid blood. The body was still warm, but exhaled a fetid odour; the abdomen was tympanitic; the integuments and bones of the cranium presented nothing extraordinary; their vessels, as well as those of the brain, contained some liquid blood; the cerebral substance was extraordinarily softened; the lateral *ventricles contained a bloody serum.* The *pericardium presented* a *slightly* inflammatory tint on its inner surface; the right ventricle of the heart contained a little black liquid blood; the blood of the left ventricle was red and frothy, &c. &c."

A little further on, in the same treatise, the author has the following paragraph:—

"Baglivi, in 1694, and Lancisi, in 1705, saw apoplexy suddenly become so common in certain parts of Italy that they have described it as having been in *those years really epidemic.*"

I have looked into these old authors, and find in the former the following quaint and interesting statement:—

"*For these last two years* (I *mean* 1694 *and* 1695), the Apoplexy has swept off great numbers of People both in this city and all over Italy, and the fatal effects of this Disease were so frequent that they alarmed even the healthful with apprehensions of sudden Death. The Cause of this Epidemick Apoplexy is justly imputed to the unusual Constitution of the Weather in those years. The Summer of 1693 was so extream hot and scorching, which was followed by nipping cold Weather, in the beginning of 1694, and, contrary to the Custom of Italy, with a rigid Frost, Snow, and Ice. * * * The Summer after that was much hotter than the former, insomuch that for five Months together there was no Rain. About the beginning of *October* it began to be wet weather, and continued such, with a Southerly Wind to April, 1695, and that to such a degree that so much Rain was not seen to fall at one time within the memory of Man. After fifteen days of continued Rain, perhaps we had two days clear Weather, which were followed by heavier Rains than went before. After this uncustomary Weather, the above-mentioned Apoplexies display'd their Rage; and perhaps some part of the Epidemick illness was owing to the Universal Grief and Domestick Care, occasioned by such calamitous times; all *Europe* being at the same time engaged in a sharp War, the like of which has scarce been heard of since the Foundations of the Universe were laid. So many Cities were raz'd and burnt; so many thousands of Men slain; all Commerce disturbed, and the Avenues of Peace block'd up, that the strongest heart could not bear the Thoughts of it."[1]

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[1] "The Practice of Physick reduced to the Ancient way of Observations. Containing a Just Parallel between the wisdom and experience of the Ancients and the Hypotheses of Modern Physicians, &c. &c. Written in Latine by Geo. Baglivi, M. D., Professor of Physick and Anatomy at Rome. Printed for Andr. Bell (*et al.*). London, 1704."

Further on he mentions that numerous earthquakes prevailed at this time, that many people were pinched with famine, and that the plague invaded one of the smaller towns shortly before.

While among the ancients, I may be permitted to quote from old FORESTUS,[1] who, in a series of observations on apoplexy (which for careful investigation and accuracy of description, may well put to the blush more modern writers), has this sentence: "And we have ourself seen, in the year 1562, when the condition of the atmosphere (*constitutio æris*) was humid and rainy, *and the south wind had existed for a long time*, very many persons to have perished by apoplexy." He then describes a number of cases under his care, mentions certain streets and villages as especially affected, and designates many of the attacks as *mild apoplexy* (*levis apoplexia*), from which recovery speedily took place. He recommends, among other remedies, stimulating frictions, and speaks of bleeding as unnecessary in many of these cases. Hillary,[2] in a work on tropical diseases, states that apoplexies are of frequent occurrence in Barbadoes in the month of July.

Now, I do not for one moment suppose, that all the cases thus recorded as those of apoplexy, not even all those designated as "*levis apoplexia*," were cases of sunstroke, the pathological researches of Forestus show the contrary; but I cannot forbear calling attention to the fact, that the circumstances attending their development were closely analogous to those which are mentioned by modern writers as attending and as producing sunstroke—"the south wind long existing;" the humid atmosphere as given by Forestus; the long hot and dry followed by the moist atmosphere; the conditions which precede (as before quoted from Gordon), and which resulted in earthquakes, as related by Baglivi; the mental distress prevalent in the community at the time, all these find their appropriate place, and accurately fit in the picture already given as descriptive of what we now call by the varied names of sunstroke, insolation; exhaustion from heat. Might we not without violence thus explain what otherwise it is difficult to explain, an *epidemic* of apoplexy? Descriptions similar to those already given, I find in an old copy of Lancisi,[3] who recommends the preparations of iron in the debility following such cases.

To return to the nature and *post-mortem* appearances of sunstroke, the first fact which meets us, and which very much interferes with a satisfactory investigation, is the rapidity with which putrefaction occurs. In two fatal cases which came under my notice during last summer, decomposition had occurred ten hours after death to such an extent as to render a *post-mortem* examination impossible. The exterior of the bodies was of a deep livid colour, horribly offensive discharges had taken place from the mouth and nostrils, and the surface imparted to the hand the soft boggy sensation so characteristic of decomposition.

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[1] DOMINI PETRI FORESTI, M. D., Observationum et Curationum Medicinalium ac Chirurgicarum opera omnia. Francofurti, 1634.

[2] By Wm. Hillary, with notes by Benjamin Rush, M. D. Philad., 1811.

[3] Jo. M. Lancisii, M. D., Opera omnia in unum Congesta. Venetiis, 1739.

Until the appearance of Mr. RUSSELL'S paper (*vide supra*) under the impression that the disease was allied to, if not identical with apoplexy, the attention of necroscopists appears to have been directed exclusively to the brain. Andral, in describing his cases of cerebral congestion, before quoted, gives a faithful description of the appearances now recognized as existing after sunstroke. Though meant to illustrate cerebral disease as produced by heat, with his usual accuracy, he states that with the exception of engorgement of the vessels of the meninges, there was no diseased condition of the brain other than softening, while the pulmonary vessels were equally as much engorged as those of the dura and pia mater. Russell (*loc cit.*), much to his surprise, found no lesion of the brain, though he had been taught to expect it. He states, "the brain was in all healthy; no congestion or accumulation of blood was observable, a very small quantity of serum under the base of one, but in all three *the lungs were congested even to blackness through their entire extent,* and so densely loaded were they that complete obstruction must have taken place. There was also an accumulation of blood in the right side of the heart, and the great vessels approaching it."

Dr. GERHARD had before this time noticed a similar condition of things. In his clinical lectures (Graves & Gerhard) p. 677, he says: "During the intensely hot weather of the summer of 1830, I witnessed the opening of thirty persons who died from the effects of heat; we found no organic disease of the brain, but merely a slight congestion, such as is observed in other acute diseases, which it would be idle to set down as a cause of death." Dr. PEPPER in his examinations (many of which I witnessed), found that "the brain exhibited no indications of congestion, nothing, in fact, of an unusual appearance. But in all of the four subjects the heart was pallid, flaccid, and softened, while the other muscles of the body were florid and firm. The lining membrane of the heart and of the large bloodvessels was of very dark, almost purple colour. The cavities of the heart contained but little blood and no coagulum." Similar appearances are reported by Drs. Lente and Swift. Dr. Dowler found "intense congestion of the lungs, and believes the cause of death, secondarily, perhaps, to be here." All these observers agree in representing the blood as fluid, and in a letter from Dr. B. DARRACH, now Resident Physician New York Hospital, describing the inspection of a fatal case occurring in the hospital last summer, he has written "the most interesting and remarkable appearance was the frothy fluid condition of the blood, and the distension of the heart with gas." (See following article.)

Now, no intelligent medical observer can witness, or read of these phenomena, without being struck with their resemblance, I had almost said their identity with those presented in deaths from typhus fever. Take any of our standard authorities, Wood or Gerhard, *e. g.*, and compare their descriptions of the pathological appearances of typhus with those above given.

Post-mortem Appearances in Typhus Fever.	*Post-mortem Appearances in Sunstroke.*
A strong tendency to speedy putrefaction.—Wood.	*Speedy decomposition after death.*—Dowler.
Petechial eruption a characteristic lesion.—Wood.	Face and neck covered with livid spots.—Dowler. Petechiæ.—Andral.
Blood found in the veins liquid ; coagula rare. Within the cranium there is often venous congestion, with some serous effusion in the ventricles or beneath the arachnoid ; and the substance of the brain is occasionally darker than in health, though in other cases unaltered or even whiter. No clearly ascertained connection exists betweeen the stupour and the anatomical appearance in the brain.—Wood.	Slight congestion such as occurs in other acute disease ; no organic disease of the brain.—Gerhard. Brain healthy ; a very small quantity of serous effusion in some cases ; venous congestion ; brain healthy, substance soft.—Andral. In a case of stupour and delirium no lesion of the brain found.—Swift.
The posterior and lower part of the lungs is often solidified ; of a dark red colour, fragile, and impervious to air, though without the granular appearance of hepatization.—Wood.	Lungs dark and injected with blood ; the central and posterior parts presenting the appearance of an enormous clot of blood, somewhat solid, and united by a texture bearing no resemblance to the elastic, contractile texture of healthy lung.—Dowler.
The heart sometimes natural, sometimes softened, sometimes containing liquid blood.—Wood.	Heart soft.—Pepper. " natural.—Lente. Heart filled with liquid blood.—Andral, et al.

And so too with the incidental lesions of other viscera.

If we carry our investigations further back, we shall find an astonishing identity in the symptoms presented during life. Each has a frequent and feeble pulse, each may or may not have a hot, pungent skin, each has its stupor deepening or not into coma, each its suffusion of face and eyes, its lividity of countenance, and we need but use the words given as descriptive of typhus, if we would describe some of the phenomena of sunstroke. "Now and then great restlessness and jactitation occur, with twitching in various parts of the body;" while, as if to complete the picture, I find a case of sunstroke reported in which epistaxis, a frequent attendant of typhus fever, existed.

These facts would seem to indicate that there is in sunstroke as there is in typhus fever a poisoned condition of the blood, and that it is to this that we are to refer the various morbid phenomena of the disease, an explanation which has also been given in cases of death from lightning. I cannot, however, divest my mind of the belief that in sunstroke this unnatural condition of the blood is a secondary affection, not the primary one ; that there is in the first place an exhaustion or depression of the nerve-forces which regulate nutrition, respiration, circulation, and the other acts of organic life. A condition to some extent analogous to this we have in congestive or pernicious fever, and perhaps also in cholera, though in neither of these diseases have we proof that the blood is poisoned. What are the various circumstances required to develop these results, and what the exact order in which they are produced we cannot positively say. We know so little of the nature of the vital force in its healthy condition that we can expect to know but little of the cause of deviations from the healthy standard. We can speculate, and we may draw our inferences as to the treatment, and watch for its results. If we adopt the theory recently proposed with much plausibility by Dr. DAVEY, that the so-called ganglionic system affects directly or indirectly all varieties of abnormal action, we must of course look to it for the first link in the chain of these phenomena. The vital force, place it where we will, is so affected by the modification of temperature, of meteoric or other condition of the atmosphere, that the conservative or regulating influence and supply of proper nerve power is lost in part or in whole. Hence result feeble action of the heart, imperfect respiration, stases of blood in the lungs, in the brain, loss of vitality of the blood, and the tendency evinced even during life, and still more in death, to rapid putrefaction. Just as we see, suggests Davey, under local depressing influences, slowly produced, fatty, amyloid, and other degenerations. Similar phenomena occur at either extremity of the thermometrical scale. Baron LARREY reports, as the result of the retreat from Moscow when the depressing influences of defeat were added to those of fatigue and of cold, that many perished from dizziness, vertigo, somnolence, ending in profound coma, and death. (Andral, *loc. cit.*)

If we would remedy these things we must direct our attention to the condition of system producing them, not to the mere phenomena themselves. We must not rely on local measures to relieve the congestion of the lungs or of the brain, but just as we would do in typhus and pernicious fevers, we must remedy the evil producing these congestions. That there may be congestions we do not doubt, but in most instances they are *passive* congestions—a stasis of blood from want of the usual motive power. *Post-mortem* inspections in all these diseases show us this, and death is often produced by a treatment based upon different views as to their nature. And yet bleeding has been the treatment practised by many even to the present time. Not to mention those of earlier date, Dr. GORDON, as late as last year, reporting 28 cases, only one of which recovered, seems to have bled every case. The solitary survivor is said to have undergone the following heroic treatment: "*Slight cautery to the nape of the neck, opening of the right temporal artery*, and, while the patient lay unconscious, a powerful jet of water was directed on the head and epigastrium, croton oil being exhibited internally!" Without quoting separately each author, let me here state that nearly all our American writers agree that bleeding, so far from being of advantage, generally hastens a fatal termination. Dr. Beatson (*loc. cit.*), after giving a fearful history of the results of bleeding in such cases, says of three cases treated by him all recovered. His plan of treatment was "to unfasten as quickly as possible the man's dress and accoutrements, to expose the neck and chest, get him under the shade of a bush, raise his head a little, and commence the affusion of cold water from a sheepskin bag, continuing the affusion, at intervals, over head, chest, and epigastrium, until consciousness and the power of swallowing returned. When this takes place the affusion may be stopped, and a stimulant mixture given occasionally in small doses."

I believe this to be, with some modifications, the treatment called for. In typhus and in pernicious fevers, we find cold affusions to have been long used, and with advantage; but, as in them so in sunstroke, I can readily conceive there may be instances in which the powers of life may be so spent, as to fail to respond to the shock of the cold, and the existing depression be thus increased; nor in any case should they be persevered in after the skin begins to assume a moist and healthy condition. So, too, in regard to the use of ice to the head, which is not to be resorted to indiscriminately. Where the individual can readily swallow, recourse may at once be had to stimulants, of which ammonia, in some form, is the one most frequently used. The carbonate of ammonia, in gr. v—gr. x doses, and the aromatic spirit, have been used by me with advantage. In the *New York Journal of Medicine* for 1854, p. 58, Dr. J. R. Leaming urges the use of muriate of ammonia in eight-grain doses every half hour. The cases are not very fully reported, and the pulse is described as *slow* and weak—a condition I have never seen in sunstroke. Dr. Dowler quotes from a German medical journal what purports to be "a most efficacious remedy in *coup de soleil:* acetic ether dissolved in wine vinegar, to be applied as a lotion on the forehead, temples, cheeks, hands, and chest, and the same to be given every half hour with coffee."[1]

Unless swallowing can be readily accomplished, I think it best to avoid the exhibition of remedies by the mouth, as, passing into the trachea, they often occasion unpleasant coughing and distress. In the cases mentioned by me at the College of Physicians, I ventured to suggest that there might be a special value in the oil of turpentine, whether given by the mouth or, as in the cases there reported, by the rectum. I would again mention this remedy, and strongly urge its trial. As a stimulating enema, it has long been used; but it may be more than this; and the results in the cases alluded to were, to say the least, gratifying. It was prescribed in doses of f℥j of oil of turpentine, in a half pint of liquid, every half hour, until reaction began. Of the value of oil of turpentine in typhus and other malignant fevers, in scurvy and other altered conditions of the blood, there is strong evidence. In typhoid fever, we all know it to be useful, and the results of the cases treated recently in the hospital confirm me in the belief, that in sunstroke, which, as we have seen, resembles typhus fever in so many of its features, it is also of especial value. Nor is it a new remedy, even in cases regarded as apoplexy. Forestus, before quoted, in his cases of mild apoplexy which recovered, used, as one of his most efficient agents, the oil of turpentine. I may here quote from the *Transactions* of the College the following passages:—

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[1] Since the above was written, I have seen an interesting paper in the *London Lancet*, by J. R. Taylor, Esq., Deputy Inspector of Hospitals, on "Erethismus Tropicus," the name given by the writer "to the state of system which exhibits the acute effects of continued high tropical temperature on the European." Some of the cases therein recorded presented the ordinary phenomena of sunstroke, while in others the symptoms seem to have been modified by an epidemic of cholera which had preceded, and, as I believe, left its impress on the subsequent epidemic. The reports of these cases coincide in many respects with those I have given. The subjects of the attack were "men of remarkably stout build," but *unacclimated.* The pathological appearances differ but little from those given above, and the author of the paper recommends as the most effective treatment, cold affusions and the avoidance of venesection as a general rule. (See *London Lancet* for August 21—28, 1858.)

"If one principle were more insisted on than another in the treatment of these cases, it was the importance of avoiding any expenditure of the little remaining strength of the patient. Though recommended in such cases, the full bath is not without danger. The chief indication for its use is found in the stimulus afforded by the *hot* bath—for which, in practice, the *warm* bath is often substituted—the depressing influence of which may fatally exhaust the forces which barely maintain the balance between life and death. * * During this time, the patient should have his feet placed in a strong mustard foot bath, but without any exertion on his part. When able to swallow, brandy, wine whey, or, as before mentioned, ammonia may be given him."

In a recent visit to the New York Hospital, I was told by Dr. B. Darrach, one of the resident physicians, that, to relieve the burning heat of the skin—which is justly viewed as a most unfavourable prognostic symptom—it had occurred to him that frictions of the body *with ice* might be useful, and that he had carried out the suggestion with very happy results.

After the immediate symptoms of an attack have passed, as after cholera, typhus fever, &c., so with sunstroke, various internal inflammations may be developed—as of the brain, the lungs, &c.—which require a treatment entirely unlike that mentioned above. In this way, we have cases reported as meningitis resulting from exposure to heat; but, according to my observation, these differ from sunstroke in their gradual mode of attack, although just as apoplexy may occur in warm weather, so may meningitis; but in by far the greater number of cases of sudden attacks of illness from exposure to heat, inflammation of the brain is not the pathological condition. Nor must we be misled by the presence of delirium, or of a hot skin, in such cases. The latter we have present even in malignant typhus, and no fact is better known to the pathologist than this: that, in typhus and typhoid fever, phenomena almost identical in character with those of inflammation of the brain may be present, and yet, after death, no lesion of this organ be found. In the words of Dr. Bartlett, when writing of typhus fever, "Delirium and somnolence have occurred as frequently, and as strongly marked, in patients whose brains presented no changes, as in those of an opposite character."

OCTOBER 14, 1858.

ART. III.—*Cases of Exhaustion from Heat treated in the New York Hospital by Stimulants and Ice to the entire Surface of the Body.*

Reported by B. DARRACH, M. D., Resident Physician.

CASE I. Daniel Murphy, æt. 29, native of Ireland, labourer, was admitted August 14, 1857; brought by the police from a drug-store, without any history of his attack. Comatose; skin burning hot, but moist; respiration 40 per minute, stertorous, laboured, and sighing; pulse 160, and feeble; pupils contracted, and insensible to light; eyes congested; has great difficulty in deglutition; vomited before admission. Ordered an enema of carbonate of ammonia and brandy, ice to the head, and sinapisms to the chest, abdomen, and thighs. While under this treatment, the intense heat of skin seemed to indicate some attempt to reduce it. Ice was accordingly applied to the body, at first cautiously. In half an hour he vomited some green fluid, and had a tetanic convulsion of the muscles on the back of the neck. Pupils dilating, and show signs of sensibility. Ice applied more freely, being rubbed over the whole body and down the arms and legs. Sinapisms removed. Three hours after admission he had a violent convulsion; pupils dilated, and sensible to light; the heat of skin still kept down by ice.

Aug. 15. The ice was applied at short intervals through the night. Patient was conscious this morning; but now, 11 A. M., is semi-comatose. Pupils contracted; skin comfortable; tongue dry and brown, with sordes on the teeth; pulse 108 to 120, feeble. Treatment suspended early this morning.

16*th.* Yesterday afternoon he was able to give his name and age, but spoke so indistinctly that nothing else could be understood. Has an idiotic expression of countenance.

20*th.* Notices himself a difficulty in his articulation, though it is very much improved. Says that on the day he was taken sick he had felt bad all day; had drank four or five glasses of brandy, and freely of cold water.

28*th.* Still speaks indistinctly, but is otherwise perfectly well. Discharged.

CASE II. Marie Hass, æt. 19, German emigrant just arrived, admitted June 26, 1858. Had been running about all day. Was said to have had a slight attack of sunstroke in the morning. Ate a hearty dinner, and drank freely of beer and ice-water. Was taken suddenly sick on the Erie Railroad Pier about 3 P. M., and brought to the hospital about three hours afterwards. On admission she was insensible, with violent convulsions; skin